HYPERTENSION /HIGH BLOOD PRESSURE

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General Info about Hypertension

High blood pressure (**hypertension**) is often called the silent killer because you can have it for years without knowing it.

High blood pressure or **hypertension** means high pressure (tension) in the arteries. The arteries are the vessels that carry blood from the pumping heart to all of the tissues and organs of the body.

Blood pressure is typically recorded as the systolic pressure (as the heart beats) over the diastolic pressure (as the heart relaxes between beats). A consistent blood pressure reading of 140/90 mm Hg or higher is considered high blood pressure, another term for **hypertension**.

For both systolic and diastolic blood pressure there is evidence that in a substantial portion of the total population variability can be attributed to genetic differencesi. We

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calculated the "heritability" index for systolic and diastolic blood pressuresi. Theiindices were 0.82 and 0.64 respectively for systolic and diastolic blood pressures.

-N.O. Borhani, M. Feinleib, R.T. Garrison, and others, 1977

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What are the causes of Hypertension ?

It's not always possible to determine why blood pressure reaches higher levels in some people. Causes may include narrowing of the arteries or due to the heart beating faster or more forcefully than it should.

High blood pressure might also be caused by another factor such as:

- Tablets, which include birth control pills, cold remedies, decongestants, pain relievers.
- Kidney diseases.
- Adrenal diseases.
- Thyroid diseases.
- Abnormal blood vessels.
- Pre-eclampsia, a significant increase in blood pressure during the last 3 months of pregnancy.
- Use of illegal drugs such as cocaine and amphetamines.

Risk factors:

The major risk factors are:

- Age-Blood pressure increases as age increases.
- Race-High blood pressure is more common in blacks than in whites.
- Sex- In young adulthood and early middle age, men have high blood pressure more often than women.
- Genetics- High blood pressure tends to run in families.

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What are the symptoms of Hypertension ?

Most people with high blood pressure have no signs or symptoms headaches, dizziness or nosebleeds are common

in kidney failure
- Nitric oxide involve in high blood pressure

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warning signs of high blood pressure.

Other conditions that can lead to uncontrolled high blood pressure cause the following symptoms:

- Excessive perspiration
- Muscle cramps
- Weakness
- Frequent urination
- Rapid or irregular heartbeat (palpitations)

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How can we diagnose Hypertension ?

The blood pressure usually is measured with a small, portable instrument called a blood pressure instrument (sphygmomanometer) (Sphygmo in Greek means pulse, and a manometer measures pressure.). The blood pressure instrument basically consists of an air pump, a pressure gauge, and a rubber cuff. The instrument registers the blood pressure in units called millimeters of mercury (mm Hg).
The cuff is placed around the upper arm and inflated to a pressure that blocks the flow of blood in the main artery (brachial artery) that travels through the arm. Then, the pressure of the cuff on the arm and artery is gradually released. As the pressure decreases, the health practitioner listens with a stethoscope over the artery at the front of the elbow. The pressure at which the practitioner first hears a pulsation over the artery is the systolic pressure. As the cuff pressure decreases further, the pressure at which the pulsation finally stops is the diastolic pressure.

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How can Hypertension be treated ?

Goal of treatment is to maintain blood pressure below 140/90 and lower for people with other conditions, such as diabetes and kidney disease. Adopting healthy lifestyle habits is an effective first step in both preventing and controlling high blood pressure.

The major types of medication first chosen to control high blood pressure include:
Diuretics: These medications act on kidneys to help the body eliminate sodium and water, reducing blood volume.

Beta-blockers: These medications block the effects of certain adrenaline-related chemicals, causing your heart to

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beat more slowly and less forcefully.

Angiotensin-converting enzyme (ACE) inhibitors: These medications help relax blood vessels by blocking the formation of a naturally occurring chemical that narrows blood vessels.

Calcium antagonists: Calcium antagonists also known as calcium channel blockers. These medications help relax the muscles of blood vessels.

Prevention

Healthy diet: Research has shown that following a healthy eating plan can both reduce the risk of developing high blood pressure and lower an already elevated blood pressure. Study shows that **hypertension** was reduced by an eating plan that emphasizes fruits, vegetables, and low-fat dairy foods. The diet should include whole grains, poultry, fish, and nuts and has reduced amounts of fats, red meats, sweets, and sugared beverages.

Reduce Salt and Sodium in Your Diet: A key to healthy eating is choosing foods containing less salt and sodium. The current recommendation is to consume less than 2.4 grams. This equals to 6 grams or about 1 teaspoon of table salt a day.

Reduce your weight: Being overweight increases blood pressure and is also a risk factor for heart disease.

Exercise: Being physically active is one of the most important steps you can take to prevent or control high blood pressure. It also helps reduce your risk of heart disease.

Quit Smoking: Smoking injures blood vessel walls and speeds up the process of hardening of the arteries.

Limit alcohol and caffeine: Even if you're healthy, alcohol and caffeine can raise your blood pressure to an unhealthy level. Reducing your consumption of alcohol can reduce your blood pressure.

Control stress: The effects of stress are usually only temporary. But if you experience stress regularly, it can produce increases in blood pressure that can iÖ over time iÖ damage your arteries, heart, brain, kidneys and eyes.

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Effects of Hypertension:

Stroke: Hypertension is the most important risk factor for stroke. Very high pressure can cause a break in a weakened blood vessel, which then bleeds in the brain. This can cause a stroke. If a blood clot blocks one of the narrowed arteries, it can also cause a stroke.

Impaired Vision: High blood pressure can eventually cause blood vessels in the eye to burst or bleed. Vision may become blurred or otherwise impaired and can result in blindness.

Arteries: As people get older, arteries in the body "harden," especially those in the heart, brain, and kidneys. This, in turn, causes the heart and kidneys to work harder.

Kidney Damage: The kidneys act as filters to rid the body of wastes. Over time, high blood pressure can narrow and thicken the blood vessels of the kidneys. The kidneys filter less fluid, and waste builds up in the blood. The kidneys may fail altogether.

Heart Attack: High blood pressure is a major risk factor for heart **attack**. The arteries bring oxygen-carrying blood to the heart muscle. If the heart cannot get enough oxygen, chest pain, also known as "angina," can occur. If the flow of blood is blocked, a heart **attack** results.

Congestive Heart Failure: High blood pressure is the number one risk factor for congestive heart failure (CHF). CHF is a serious condition in which the heart is unable to pump enough blood to supply the body's needs.

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Frequently asked questions about Hypertension...

Which doctor would be best suited to treat BP?
A general physician can treat BP.

What is systolic blood pressure?
Systolic pressure is the force of blood in the arteries as the heart beats. It is shown as the top number in a blood pressure reading.

What is diastolic blood pressure?
Diastolic pressure is the force of blood in the arteries as the heart relaxes between beats. It's shown as the bottom number in a blood pressure reading.

How do I know if I have high blood pressure?
High blood pressure often has no signs or symptoms. The only way to find out if you have high blood pressure is to be tested for it.

How Is Blood Pressure Tested?
Having your blood pressure tested is quick and easy. Blood pressure is measured in millimeters of mercury (mm Hg) and recorded as two numbers systolic pressure "over" diastolic pressure.

Do mineral supplements reduce blood pressure?
Potassium helps to prevent and control blood pressure. Some good sources are various fruits, vegetables, dairy foods, and fish.

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Glossary

Antihypertensive - Counteracting high blood pressure.
Arteries - Blood vessels that carry blood away from the heart.
Blood pressure - The pressure of the blood on the walls of the arteries, dependent on the energy of the heart action, the elasticity of the walls of the arteries, and the volume and viscosity (resistance) of the blood.
Blood vessel - Any channel that carries blood; includes arteries, arterioles, capillaries, venules, and veins.
Congestive heart failure - A condition in which the heart is unable to pump blood at an adequate rate or in adequate volume.
mmHg - Millimeter of mercury, a unit of pressure equal to that exerted by a column of mercury at 0 degrees C one millimeter high at sea level.
Pre-eclampsia - An illness of pregnancy characterized by high blood pressure, swelling or edema, and proteinuria.

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A study which appeared in the clinical journal of Ophthalmology concludes that farsightedness appears to be associated with a five-year risk of ocular **hypertension**, and nearsightedness is associated with a significantly increased prevalence// of glaucoma, in Caucasians.

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3. Drug used to treat hypertension effective in countering Migraines

Migraines,headaches which involve intense throbbing pain, sometimes accompanied by visual disturbances as well as sensitivity to light and sounds, have been found to respond to a drug hitherto used to treat high blood pressure//.

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4. Risk of dementia reduced hypertension drugs

According to a new study it is observed that reducing blood pressure by medication can reduce the risk of dementia by half.

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5. New drug for hypertension

The National Chemical Laboratory (NCL) and Emcure Pharmaceuticals Ltd, a Pune-based company have jointly come out with a new drug for the treatment of **hypertension**.

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6. Preventing 'white coat' hypertension

Researchers at the University of Southampton say that

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Hypertension and Renal Artery Disease

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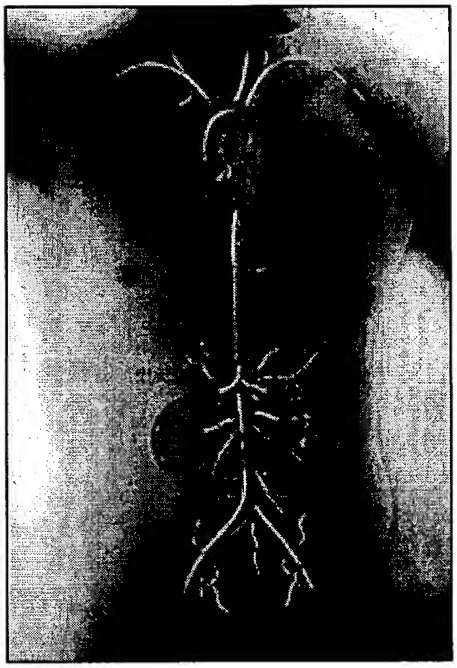
What is Hypertension?



The incidence of ***hypertension***, or high blood pressure, is on the rise in the United States, with at least 50 million people affected. By definition, the diagnosis of **hypertension** is given when the ***systolic blood pressure (SBP)*** $\geq$ 140 mmHg and/or the ***diastolic blood pressure (DBP)*** $\geq$ 90 mmHg. **Hypertension** occurs in 10-20% of persons aged 25 to 45 years and 30-40% of persons aged 55 to 74 years. Although it is a "silent" disease in that patients usually have no specific symptoms, **hypertension** poses as a major risk factor for coronary artery disease (heart attack), cerebrovascular disease (stroke), and renal disease (kidney failure).

There are 2 categories of **hypertension**. Over 90% of all cases of high blood pressure are called ***"Essential Hypertension"***, which has no specific identifiable cause but is due to the body's inability to regulate the blood pressure within the normal range – **SBP** 120-140 mmHg/**DBP** 60-85 mmHg. Onset is usually between ages 30 and 50 years. Essential **hypertension** is treated with medication, diet, and fluid restriction and is not curable. ***"Secondary Hypertension"***, on the other hand, is high blood pressure that has an identifiable cause, occurs in a wide age range, is severe, and is abrupt in onset. Secondary **hypertension** is potentially curable because it is most commonly caused by ***stenosis***, or narrowing, of the renal (kidney) arteries. Less often, secondary **hypertension** can be caused by tumors of the adrenal gland that secrete hormones acting to increase the blood pressure.

Knowing that untreated or poorly managed **hypertension** has adverse consequences on the brain, heart, and kidneys, it is very important disease to identify and aggressively treat. For patients with essential **hypertension**, treatment is accomplished with medication and lifestyle modifications. However, in those

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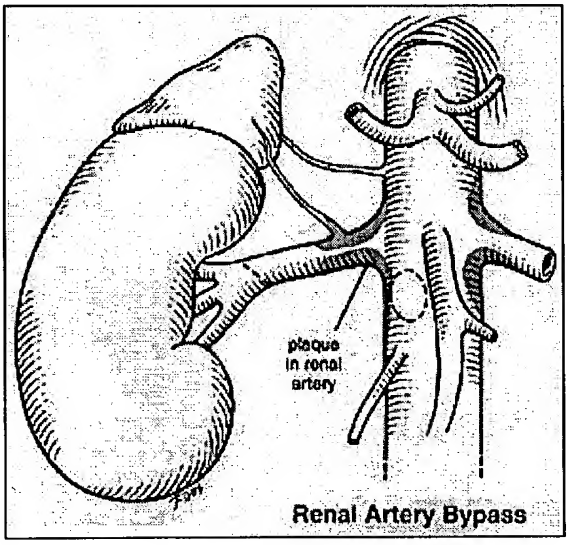
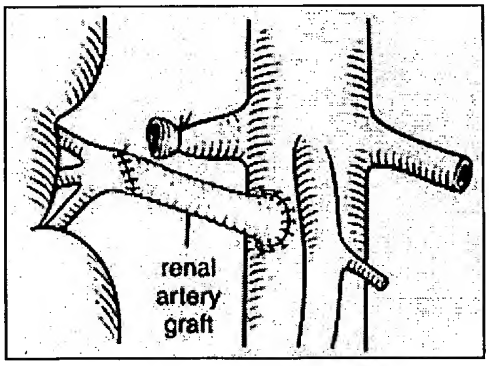
patients with a potentially correctable cause of **hypertension**, prompt recognition and treatment of the underlying cause may cure or dramatically improve blood pressure control and decrease related injury to the heart, brain, blood vessels, and kidneys.

Renovascular Hypertension

Patients with unusually high blood pressure (***SBP*** > 200 mm Hg/***DBP*** > 100 mm Hg) that requires more than the usual doses of medication to control are more likely to have secondary **hypertension**. A diagnosis of secondary **hypertension** may also be considered if patients who have had more mild **hypertension** (***SBP*** 140-159 mmHg/***DBP*** 90-99 mmHg) for many years become more difficult to control, requiring higher doses or additional medications for blood pressure control.



Above: A renal artery bypass graft is used to bypass arterial plaque.



Above: The graft in position.

The most common cause of secondary **hypertension** is ***renal artery stenosis*** or narrowing of the arteries to the kidneys. The most common cause of narrowing is atherosclerosis, the buildup of fatty plaques inside the arteries. Blockage of the renal arteries causes the kidney to increase production of the hormone ***renin***. Increased levels of renin in the body cause a cascade of events to occur that result in ***peripheral vasoconstriction*** (arteries to constrict or tighten) and fluid retention, causing an increase in blood pressure. Renovascular **hypertension** is particularly dangerous to the heart because of the direct toxic effects of the ***"renin-angiotensin system"*** on the heart muscle. In addition, as the renal arteries become narrow, the kidney is deprived of its normal blood flow, which can lead to kidney failure.

Signs and Symptoms

Some of the signs and symptoms associated with renovascular **hypertension** include:

- Onset of **hypertension** < 20 years of age and > 55 years of age
- Loss of control of blood pressure in presence of long-standing **hypertension**
- Accelerated rate of **hypertension** in any age group
- Presence of abdominal, epigastric or flank bruit
- Marked change (decrease) in adult kidney size
- Recurrent pulmonary edema in presence of poorly controlled **hypertension**

Diagnostic Testing
If you are suspected to have renovascular **hypertension** or your blood pressure has been difficult to control despite medication, a low salt diet, regular exercise and weight loss, your physician may refer you to a vascular surgeon for further evaluation.

- **Non-invasive testing**: These tests are performed on an outpatient basis. They are virtually painless methods of examining the blood flow to the kidneys, with minimal associated side effects or risks.

    1. LABORATORY TESTS: These blood and urine tests evaluate the extent of compromise in the functioning of the kidneys and the presence of other diseases (e.g. cardiac, endocrine)

    2. DUPLEX SCANNING: This test gives an ultrasound picture of the abdomen and renal arteries, providing information on the size of the blood vessel and the state of its blood flow.

    3. MAGNETIC RESONANCE IMAGING/ANGIOGRAM (***MRI/MRA***): This test is useful for imaging larger blood vessels

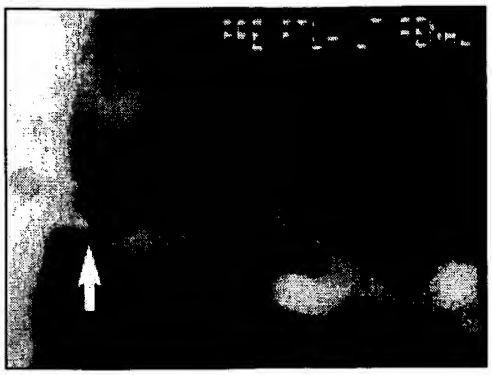
- **Invasive testing**: Tests in this category involve the injecting of a contrast dye into the body while you are awake. It enables the physician to have more detailed information about the blood vessels.

    1. ARTERIOGRAM (***angiogram***): This procedure is considered the "gold standard" of renal artery evaluation and is the most helpful in determining the diagnosis of renal artery stenosis and whether ***endovascular*** or surgical repair might be appropriate.

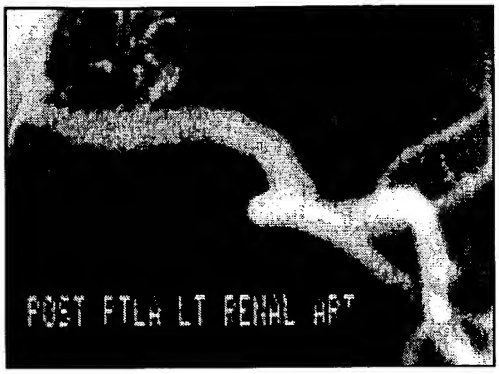
Treatment
If renal artery stenosis is detected, the vascular surgeon will determine which method of repair would be the most appropriate and beneficial for each patient's unique situation.

- ANGIOPLASTY: This is an endovascular technique that involves inflating a balloon within the narrowed artery to widen the vessel and improve flow. The balloon is introduced through a puncture site in either the groin (more common) or arm.

- **STENT** PLACEMENT: A **stent** is a metal device that is placed inside the artery that acts as a scaffold to hold the artery open. Stenting is usually performed in conjunction with angioplasty, through the same puncture site.



Above: Arteriogram demonstrating significant renal artery stenosis.



Above: After angioplasty, stenosis improved, restoring normal renal artery blood flow.

For 60% to 80% of patients with renal artery stenosis, angioplasty (+ stenting) is successful and the artery remains open for a long time. Consequently, **hypertension** is significantly improved, and sometimes even cured. Unfortunately, balloon dilatation with **stent** placed cannot keep the narrowed renal artery open in 20% to 40% of patients with renovascular **hypertension**. For these patients, open surgery is required.

- ENDARTERECTOMY: This operation involves an abdominal incision and a 7-10 day hospital stay. During the procedure, the narrowed artery is opened and the plaque is removed. The opening in the artery is then closed and blood flow is restored to the kidney.

- BYPASS SURGERY: This method of repair also involves an abdominal incision and a 7-10 day hospital stay. A graft is placed to ***bypass*** or "go around" the area of blockage, thereby restoring blood flow and pressure to the affected kidney.

All of the above procedures can be performed on the artery of one kidney or, if necessary, both kidneys. The results of surgical intervention are excellent; 80% to 90% of patients have significant relief or are "cured" of **hypertension**.

Conclusion

Renal artery disease and renovascular **hypertension** are complex disorders that affect the heart, brain, blood vessels, and kidneys. Prompt diagnosis and timely intervention done by a skilled vascular surgeon can significantly decrease target organ damage and potentially cure high blood pressure due to renal artery disease.

For more information and evaluation of your **hypertension** and renal arteries, contact the **USC Center for Vascular Care** at (323) 442-5932.

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